THIS MEMORANDUM OF AGREEMENT is made on June 4, 1979

AMONG:

THE DEPARTMENT OF ENERGY, MINES AND RESOURCES OF CANADA, ("EMR")

THE ALBERTA OIL SANDS TECHNOLOGY AND RESEARCH AUTHORITY, ("AOSTRA")

THE DEPARTMENT OF MINERAL RESOURCES OF THE PROVINCE OF SASKATCHEWAN ("SASKATCHEWAN")

For Canada

and

THE DEPARTMENT OF ENERGY OF THE UNITED STATES ("DOE")

For the United States of America

1. On June 4, 1979, EMR, AOSTRA and SASKATCHEWAN entered into an agreement with DOE entitled "Memorandum of Understanding for Cooperation in the Research and Development of Tar Sands (Oil Sands) and Heavy Oil" (the "Memorandum of Understanding") for the purpose of establishing a framework for a program of co-operation among the parties in research and development activities in the field of tar sands and heavy oil extraction, processing and related technologies;

2. The major objectives of the parties to the Memorandum of Understanding are the assembling, coordination and interpretation of existing knowledge of the United States' and Canadian tar sands and heavy oil deposits, and the development of a data base to transfer information on tar sands and heavy oil to the public and to each other;

3. To realize the aforementioned objectives, EMR, AOSTRA, SASKATCHEWAN and DOE wish to acknowledge and enter into a proposal entitled "Joint Canadian - U.S. Proposal for Resource Characterization of Oil Sands (Tar Sands)", (the "Proposal") a copy of which is attached to this agreement as Appendix I, and by affixing their respective signatures hereto the parties acknowledge and agree that they will

endeavour to work toward attaining the aforementioned objectives within the cost framework established in the Proposal and within one year from the date this Memorandum of Agreement is executed.

THE DEPARTMENT OF ENERGY, MINES AND RESOURCES OF CANADA

Per: _____

Per: _____

THE ALBERTA OIL SANDS TECHNOLOGY AND RESEARCH AUTHORITY

Per: _____

Per: _____
Minister of Federal and Intergovernmental Affairs for the Province of Alberta

THE DEPARTMENT OF MINERAL RESOURCES OF THE PROVINCE OF SASKATCHEWAN

Per: _____

Per: _____

For Canada

THE DEPARTMENT OF ENERGY OF THE UNITED STATES

Per: _____

Per: _____

For the United States of America

APPENDIX I

JOINT CANADIAN-U.S. PROPOSAL FOR RESOURCE CHARACTERIZATION OF OIL SANDS (TAR SANDS)

I. OBJECTIVE

To assemble, coordinate, and interpret existing knowledge of the U.S. and Canadian resource and the characteristics of each deposit.

To develop comprehensive data on the nature of major oil sand (tar sand) deposits to provide data vital to evaluation of the application of technologies for production and utilization.

To develop an oil sand (tar sand) resource and deposit characteristics' data base employing computerized methods, to improve usefulness of the data base and facilitate transfer of oil sand (tar sand) information to the public and to each other's data base.

II. BACKGROUND

To date only some of the existing knowledge of each country's oil sand (tar sand) resources has been exchanged.

Data bases in each country have not been fully exploited, especially in application of physical and geological properties of oil sand (tar sand) deposits to production technologies.

Cooperative agreements between Canada and the United States have not here-to-fore been implemented for the benefit of a total oil sands (tar sands) recovery technology.

The U.S. has not developed a large-scale data base in oil sands (tar sands) data but is presently involved in such an effort. The Canadian oil sands (tar sands) data base and sample bank are currently being developed by the Alberta Research Council.

Several U.S. federal agencies, particularly U.S.D.I., U.S.E.R.D.A., and U.S.D.O.E. have sponsored small-scale and uncoordinated oil sands (tar sands) assessment efforts in the past 10 years, but no central point has been established for the collection, evaluation, and interpretation of oil sand (tar sand) resource data. The Alberta Research Council is currently establishing an Analytical Advisory Committee that is proposed to include researchers from both Canada and the United States.

This situation has resulted in the identification of the following common needs.

1. Standardization of methods of oil sand (tar sand) sampling, analysis, and evaluation.

2. A current, unified assessment of the U.S. and Canadian oil sand (tar sand) resources including geological, chemical, engineering and economic characteristics.

3. Methods to interpret deposit characteristics in terms of suitability for specific production (recovery) technologies.

4. Development of organized resource data bases within each country and establishment of a mechanism for data exchange between each country.

5. Establishment of a data collection point in the U.S. similar to that which exists in Alberta.

III. SPECIFIC PROPOSAL

Accumulate and develop comprehensive data on major U.S. and Canadian oil sand (tar sand) deposits. This information should include geology, hydrology, stratigraphy, lithology, structure, bitumen composition and characterization, bitumen profiles, porosity and permeability profiles, composition and physical and fluid flow properties of the rocks and other considerations.

It is anticipated that in the first year of the project four sets of samples from each country might be exchanged. A set may consist of one bulk sample or up to fifteen samples from a core. The data to be collected may include but is not limited to the following information.

1. Geological Description of Deposit

A geological description of the deposit is required so that insights can be obtained as to the most likely method of recovery, i.e., surface-mining or in-situ recovery.

- thickness and nature of overburden
- thickness of oil bearing zone
- areal extent of oil bearing zone
- description of associated formations
- presence of free gas and water zones
- sedimentary structure
- homogeneity of deposit
- hydrology of the geologic section within the deposit

2. Description of and Analysis of Core

- hydrocarbon content and variation along the core
- particle size of mineral matrix
- degree and type of cementation
- dominant mineral types
- clay content and type
- connate water - amount, pH, analysis
- physical structure of the oil sand (tar sand)
- bulk properties
- bore hole logging

3. Description of Hydrocarbon

- gravity
- viscosity - temperature relationships
- elemental analysis - C, H, N, O, S
- trace metal content
- functional groups and hydrocarbon types
- distillation range
- molecular weight
- residual carbon (Ramsbottom)

Deliverables

1. Standard methods of oil sand (tar sand) evaluation.

2. Exchange of samples and development of data related to special deposit characteristics which would effect specific production (recovery) technologies.

3. Review and evaluation of data obtained during this study.

4. Compilation of existing resource characterization data.

5. Creation of integrated data bases containing available data and plans for continuing future data base enlargement and consolidation.

6. The establishment of central focal points in the U.S. and Canada for all oil sand (tar sand) data to implement optimal data exchange.

IV. PROJECTED COST LEVEL

In accordance with Article 12 of the June 4, 1979 M.O.U., all costs shall be borne by the Participant that incurs them.

In the first year, it is anticipated that these costs will be approximately $100,000 by each country.

In addition, it is anticipated that the L.E.T.C. will also incur costs of $200,000 (approx.) to provide facilities equivalent to those already in place in Alberta.

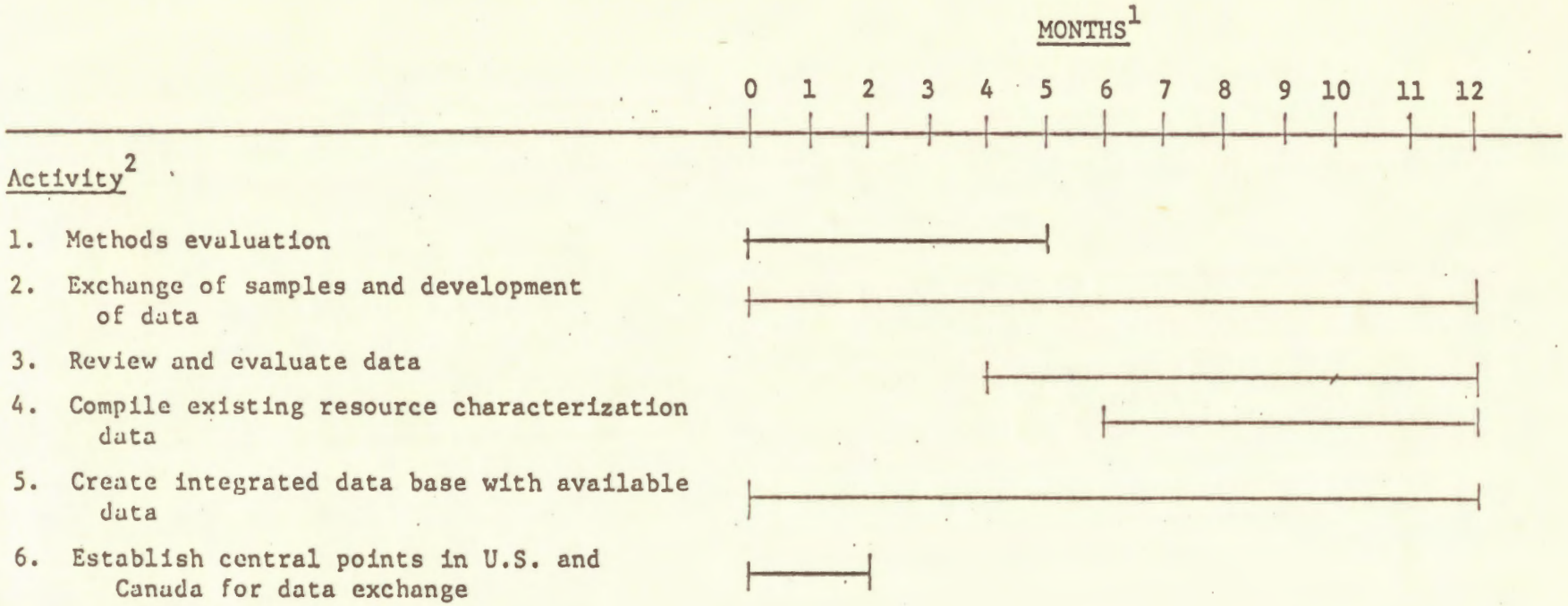
V. TIME FRAME

This cooperative project is expected to continue for at least five years. The specific proposal described in this agreement is for a twelve-month period. An anticipated time frame is given in Figure 1. A proposal for a new agreement that may be a continuation of this agreement will be prepared by the Management Team and submitted to the Participants three months before completion of this agreement.

VI. MANAGEMENT APPROACH

In accordance with Article 4.1.a of the June 4, 1979 Memorandum of Understanding, one co-chairman will be appointed by each Participant and these two individuals will constitute the Management Team. They will have the authority to appoint technical committees as are deemed necessary.

FIGURE 1 - TIMING CHART FOR INITIAL PROPOSAL



1 Time in months from actual start of cooperation.

2 The activities estimate the time thought to be needed to produce the numerically-corresponding deliverables in Section III.